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Pigments, dyestuffs and extenders — Terminology —

Part 2: Classification of colouring materials according to colouristic and chemical aspects

Pigments, colorants et matières de charge — Terminologie —

Partie 2: Classification des matières colorantes en fonction de leurs propriétés coloristiques et chimiques

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 256, *Pigments, dyestuffs and extenders*.

ISO 18451 consists of the following parts, under the general title *Pigments, dyestuffs and extenders — Terminology*:

— *Part 1: General terms*

— *Part 2: Classification of colouring materials according to colouristic and chemical aspects*

Introduction

In accordance with ISO 18451-1, it depends on the individual application as to whether a substance is to be considered as a pigment or as an extender. Substances like aluminium silicate, barium sulfate and calcium carbonate are taken into consideration in Clauses 2 and 3.

In addition to the examples of the colouring materials, the designation in accordance with the Colour Index[1)] has been included. However it is to be noted that for a number of the given designations of colouring materials (which are partly collective designations) not only one designation in accordance with the Colour Index is possible, even if in this part of ISO 18451 only one Colour Index designation is given.

In the "Classification scheme" in Clause 2, some spaces are empty. Corresponding colouring materials are either without practical importance or they do not exist for physical reasons.

Inorganic dyestuffs, e.g. those for use with enamel, glass, ceramics and food, have been only mentioned in Clauses 2 and 3 but not classified in accordance with certain aspects. The reason for this is that up to now such colouring materials are excluded from the work of ISO/TC 256.

1) The Colour Index (briefly: C.I.) is a work of reference existing since 1925, and comprising all usual colouring materials and dyestuff chemicals being used as their basis. It is accepted as a standard work in the field of pigment and dyestuff chemistry.

Pigments, dyestuffs and extenders — Terminology —

Part 2:
Classification of colouring materials according to colouristic and chemical aspects

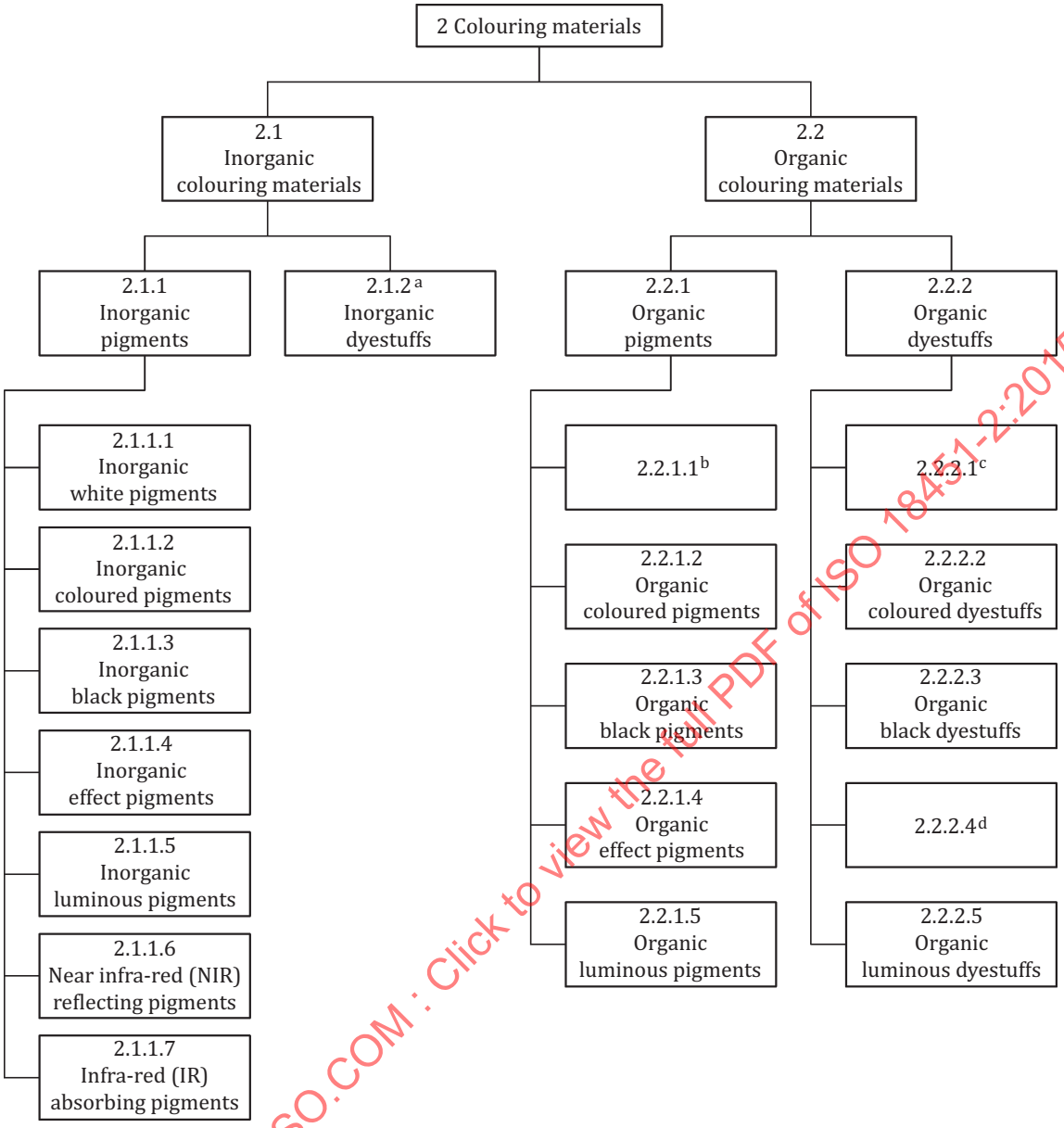
1 Scope

This part of ISO 18451 applies for the industry producing colouring materials and the consumer who uses the products of this industry. In this part of ISO 18451, the colouring materials are classified in accordance with colouristic and chemical aspects.

Some dyestuffs for use in the ceramics and food industries are listed as examples.

2 Classification of inorganic and organic colouring materials in accordance with colouristic aspects

Inorganic and organic colouring materials are classified in accordance with colouristic aspects as given in Figure 1.



Key

a See Introduction.

b Corresponding products ("organic white pigments") are at present without practical importance.

c Corresponding products ("organic white dyestuffs") do not exist for physical reasons.

d Corresponding products ("organic effect dyestuffs") do not exist for physical reasons.

Figure 1 — Classification of inorganic and organic colouring materials in accordance with colouristic aspects

The above classification is based on optical effects the reasons of which are given in the following.

White pigments The optical effect is based on light scattering, independent on the wavelength.

Coloured pigments The optical effect is based on light absorption, dependent on the wavelength, combined with light scattering.

Coloured dyestuffs The optical effect is based on light absorption, dependent on the wavelength.

Black colouring materials The optical effect is based on light absorption, independent on the wavelength, in the visual range of light.

Effect pigments The optical effect is based at least on one of the following effects:

— in the case of metallic flake pigments on the directed reflectance of mainly flat shaped and aligned metallic pigment particles;

— in the case of nacreous pigments on the directed reflectance of mainly flat shaped and aligned transparent small plates;

— in the case of interference pigments on the phenomenon of light interference.

Luminous colouring materials The optical effect is based on their ability to absorb radiation and to emit it as light of greater wavelength without delay with regard to time (fluorescence) or with delay with regard to time (phosphorescence).

Examples regarding the classification in accordance with colouristic aspects are given in Table 1.

Table 1 — Classification of inorganic and organic colouring materials in accordance with colouristic aspects

No.	Colouring material	Colour index[a]	
2.1	**Inorganic colouring materials**		
2.1.1	**Inorganic pigments**		
2.1.1.1	**Inorganic white pigments**		
	Aluminium silicate[a]	Pigment White 19	77004
	Barium sulfate[a]	Pigment White 21	77120
	Calcium carbonate[a]	Pigment White 18	77220
	Lithopone	Pigment White 5	77115
	Titanium dioxide	Pigment White 6	77891
	Zinc oxide/zinc white	Pigment White 4	77947
	Zinc sulfide	Pigment White 7	77975
2.1.1.2	**Inorganic coloured pigments**		
	Bismuth vanadate	Pigment Yellow 184	771740
	Cadmium yellow	Pigment Yellow 37	77199
	Chromium yellow	Pigment Yellow 34	77603
	Chromium titanium yellow	Pigment Brown 24	77310
	Iron oxide yellow	Pigment Yellow 42	77492
	Nickel titanium yellow	Pigment Yellow 53	77788
	Praseodymium yellow[e]	Pigment Yellow 159	77997
	Cadmium orange	Pigment Orange 20	77202
	Molybdate orange	Pigment Red 104	77605
	Titanium zinc tin oxide	Pigment Orange 82	
	Cadmium red	Pigment Red 108	77202
	Cerium sulfide	Pigment Red 265	77283 : 2
	Iron oxide red	Pigment Red 101	77491
	Molybdate red	Pigment Red 104	77605
	Ultramarine red	Pigment Violet 15	77007
	Zirconium iron pink[b]	Pigment Red 232	77996
	Manganese violet	Pigment Violet 16	77742
	Ultramarine violet	Pigment Violet 15	77007
	Cobalt blue	Pigment Blue 28	77346
	Iron blue	Pigment Blue 27	77510
	Ultramarine blue	Pigment Blue 29	77007
	Vanadium blue[b]	Pigment Blue 71	77998
	Chromium oxide green	Pigment Green 17	77288
	Cobalt green	Pigment Green 50	77377

[a] See Introduction and Bibliography.

[b] Corresponding products ("organic white pigments") are at present without practical importance.

[c] Corresponding products ("organic white dyestuffs") do not exist for physical reasons.

[d] Corresponding products ("organic effect dyestuffs") do not exist for physical reasons.

[e] Predominantly used in the ceramic industry.

Table 1 *(continued)*

No.	Colouring material	Colour index[a]	
	Chromium iron brown	Pigment Brown 29	77500
	Iron oxide brown	Pigment Brown 6	77691
	Manganese brown	Pigment Yellow 164	77899
	Manganese titanium rutile	Pigment Yellow 164	
	Zinc iron brown	Pigment Yellow 119	77496
	Umber	Pigment Brown 7	77491
2.1.1.3	**Inorganic black pigments**		
	Cobalt chromium iron black	Pigment Black 27	77502
	Iron oxide black	Pigment Black 11	77499
	Manganese ferrite black	Pigment Black 26	
	Carbon black	Pigment Black 6 + 7	77266
	Spinel black	Pigment Black 28	77428
2.1.1.4	**Inorganic effect pigments**		
	Black:		
	Graphite plates	—	—
	Molybdenum sulfide	—	—
	Magnetite on mica	—	—
	Metallic (silvery, bronze):		
	Hiding:		
	Aluminium	Pigment Metal 1	77000
	Bronze (Cu, Zn)	Pigment Metal 2	77400
	Titanium dioxide on aluminium		
	Semi-transparent:		
	Iron titanate on mica	—	—
	Transparent:		
	Titanium dioxide on aluminium oxide	—	—
	Titanium dioxide on mica	—	—
	Bismuth oxichloride	Pigment White 31	77163
	Coloured hiding:		
	Fire-coloured metal bronze	Pigment Metal 2	77400
	Iron oxide on aluminium	—	—
	Organic pigments on aluminium	—	—
	Coloured semi-transparent:		
	Iron oxide or iron oxide/ aluminium	—	—

[a] See Introduction and Bibliography.

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[e] Predominantly used in the ceramic industry.

Table 1 *(continued)*

No.	Colouring material	Colour index[a]	
	Oxide on mica (muscovite/ biotite)	—	—
	Iron oxide on aluminium oxide	—	—
	Coloured transparent:	—	—
	Titanium dioxide on borosilicate (glass)	—	—
	Titanium dioxide on mica (muscovite/biotite)	—	—
	Gonio-chromatic hiding:		
	Magnesium fluoride and chromium on aluminium	—	—
	Iron oxide and silicon dioxide on aluminium	—	—
	Gonio-chromatic semi-transparent:		
	Titanium dioxide and organic pigments on aluminium	—	—
	Iron oxide on silicon dioxide	—	—
	Gonio-chromatic transparent:		
	Titanium dioxide and silicon dioxide	—	—
	containing multi-layer systems	—	—
2.1.1.5	**Inorganic luminous pigments**		
	Fluorescent pigments:		
	Silver-doped zinc sulfide	Pigment White 7	77975
	Phosphorescent pigments:		
	Copper-doped zinc sulfide	Pigment White 7	77975
2.1.1.6	**Near infrared reflecting pigments**		
	Chromium iron oxide	—	—
	Manganese antimony titanium oxide	—	—
	Titanium dioxide	—	—
2.1.1.7	**Infrared absorbing pigments**		
	Iron cobalt chromium black spinel	—	—
2.2	**Organic colouring materials**		
2.2.1	**Organic pigments**		
2.2.1.1[c]			
2.2.1.2	**Organic coloured pigments**		

[a] See Introduction and Bibliography.

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[e] Predominantly used in the ceramic industry.

Table 1 *(continued)*

No.	Colouring material	Colour index[a]	
	Anthrapyrimidine yellow	Pigment Yellow 108	68420
	Arylide yellow	Pigment Yellow 1	11680
	Azomethine yellow	Pigment Yellow 129	48042
	Benzimidazolone yellow	Pigment Yellow 154	11781
	Bisarylide yellow	Pigment Yellow 16	20040
	Diarylide yellow	Pigment Yellow 83	21108
	Flaventhrone yellow	Pigment Yellow 24	70600
	Isoindolinone yellow	Pigment Yellow 110	56280
	Pyrazolone yellow	Pigment Yellow 10	12710
	Benzimidazolone orange	Pigment Orange 36	11780
	Disazopyrazolone orange	Pigment Orange 13	21110
	Perinone orange	Pigment Orange 43	71105
	Pyranthrone orange	Pigment Orange 51	—
	Diketopyrrolopyrrole orange	Pigment Orange 73	561170
	Anthanthrone red	Pigment Red 168	59300
	Anthaquinone red	Pigment Red 177	65300
	Azo condensation red	Pigment Red 144	20735
	Betaoxinaphthenic acid 2B, manganese lake (BON red)	Pigment Red 48 : 4	15865 : 4
	Betaoxinaphthenic acid 4B, calcium lake (BON rubine)	Pigment Red 57 : 1	15850 : 1
	Dimethyl quinacridone	Pigment Red 122	73915
	Naphthol AS red	Pigment Red 112	12370
	Naphthol red	Pigment Red 3	12120
	Naphthol red C, barium lake	Pigment Red 53 : 1	15585 : 1
	Perylene red	Pigment Red 149	71137
	Thioindigo red	Pigment Red 88	73312
	Diketopyrrolopyrrole red	Pigment Red 254	56110
	Quinacridone violet	Pigment Violet 19	73900
	Dioxazine violet	Pigment Violet 23	51319
	Rhodamine B, PTM lake	Pigment Violet 1	45170 : 2
	Indanthrene blue	Pigment Blue 60	69800
	Phthalocyanine blue	Pigment Blue 15	74160
	Phthalocyanine blue	Pigment Blue 16	74100
	Triphenylmethane blue	Pigment Blue 61	42765 : 1
	Phthalocyanine green	Pigment Green 7	74260
	Pthalocyanine green	Pigment Green 36	74265

[a] See Introduction and Bibliography.

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[e] Predominantly used in the ceramic industry.

Table 1 *(continued)*

No.	Colouring material	Colour index[a]	
	Azo condensation brown	Pigment Brown 23	20060
	Benzimidazolone brown	Pigment Brown 25	12510
	Isoindoline brown	Pigment Brown 38	561660
2.2.1.3	**Organic black pigment**		
	Aniline black	Pigment Black 1	50440
	Perylene black	Pigment Black 32	71133
2.2.1.4	**Organic effect pigments**		
	Multi-layer polyester films, cut small	—	—
2.2.1.5	**Organic lumoinous pigments**		
	Azomethine fluorescence yellow	Pigment Yellow 101	48052
	Benzoxanthene fluorescence yellow	Solvent Yellow 132 in Melamine/formaldehyde resin	—
2.2.2	**Organic dyestuffs**		
2.2.2.1[d]			
2.2.2.2	**Organic coloured dyestuffs**		
	Chinoline(acid) yellow	Acid Yellow 3	47005
	Chinoline yellow (non-ionic)	Disperse Yellow 64	47023
	Diarylmethane yellow	Basic Yellow 2	41000
	Disazo yellow	Direct Yellow 12	24895
	Methine yellow	Disperse Yellow 201	—
	Monoazo 1:2-chromium complex yellow	Solvent Yellow 21	18690
	Pyrazolone yellow	Solvent Yellow 93	48160
	Methine orange	Disperse Orange 47	—
	Monoazo (acid) orange	Acid Orange 7	15510
	Monoazo (basic) orange	Basic Orange 2	11270
	Monoazo (direct) orange	Direct Orange 17	19160
	Perinone orange	Solvent Orange 60	564100
	Anthraquinone red	Solvent Red 52	68210
	Monoazo (direct) red	Direct Red 81	28160
	Monoazo red (non-ionic)	Solvent Red 1	12150
	Perinone red	Solvent Red 135	564120
		Solvent Red 179	564150
	Xanthene red	Acid Red 52	45100
	Anthraquinone violet	Disperse Violet 26	62025

[a] See Introduction and Bibliography.

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[d] Corresponding products (“organic effect dyestuffs”) do not exist for physical reasons.

[e] Predominantly used in the ceramic industry.

Table 1 *(continued)*

No.	Colouring material	Colour index[a]	
		Solvent Violet 36	61102
	Anthraquinone blue	Solvent Blue 35	61554
		Solvent Blue 97	615290
		Solvent Blue 104	61568
	Phenthiazine blue	Basic Blue 9	52015
	Phthalocyanine blue	Direct Blue 199	74190
	Phthalocyanine blue	Solvent Blue 25	74350
	Triphenylmethane blue	Acid Blue 9	42090
	Anthraquinone green	Solvent Green 3	61565
		Solvent Green 28	625580
	Triphenylmethane green	Basic Green 4	42000
	Azo cobalt complex brown	Solvent Brown 37	—
	Disazo brown	Basic Brown 1	21000
2.2.2.3	**Organic black dyestuffs**		
	Azo chromium complex (acid) black	Acid Black 52	15711
	Azo (direct) black	Direct Black 171	335500
	Azo fat black (non-ionic) (nicht)	Solvent Black 3	26150
	Phenazine flexo black	Solvent Black 5	50415
2.2.2.4[d]			
2.2.2.5	**Organic luminous dyestuffs**		
	Thioxanthene yellow	Solvent Yellow 98	56238
		Solvent Yellow 126	—
	Benzanthrone red	Solvent Orange 63	68550
	Perylene green	Solvent Green 5	59075

a See Introduction and Bibliography.

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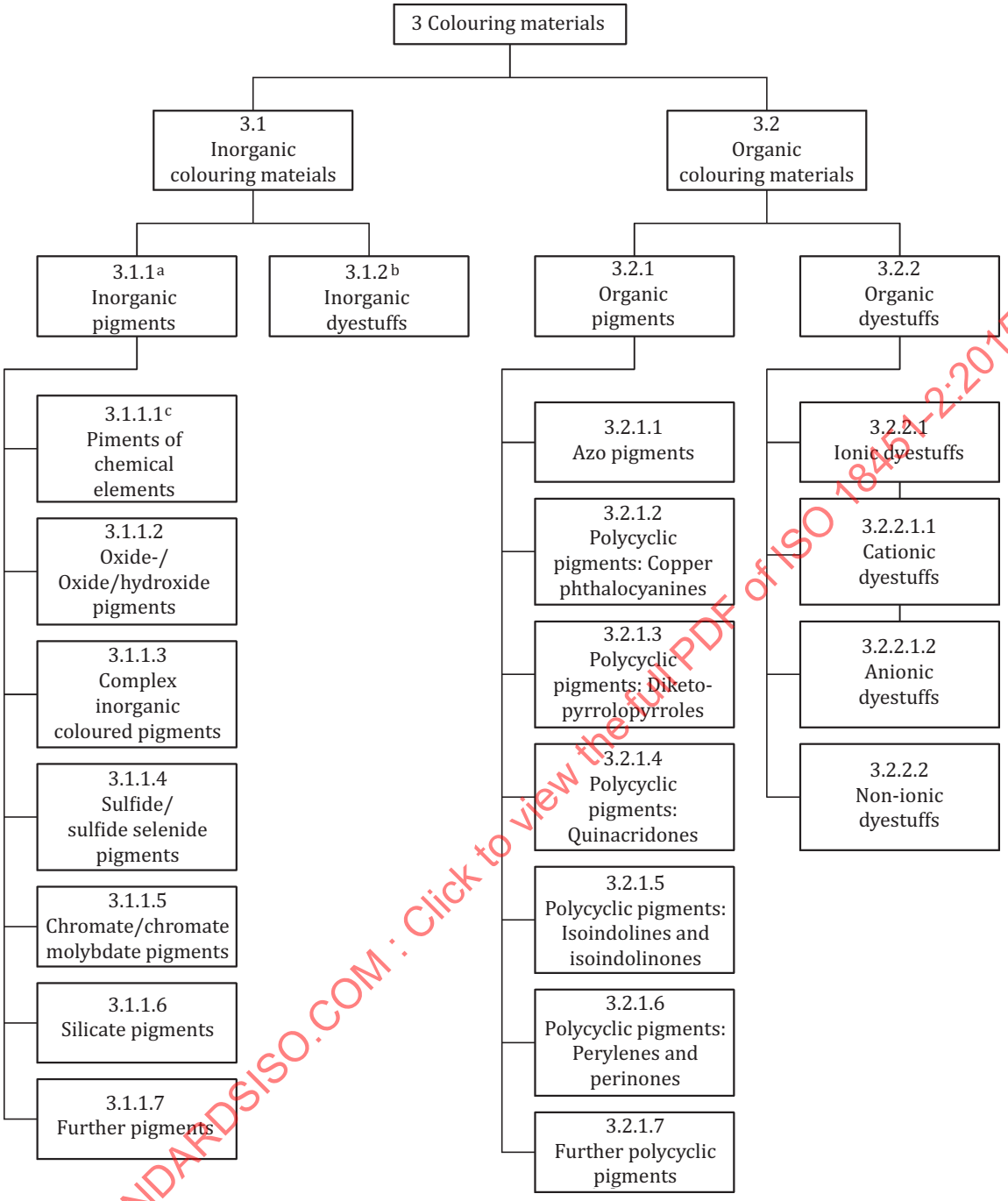
d Corresponding products ("organic effect dyestuffs") do not exist for physical reasons.

e Predominantly used in the ceramic industry.

3 Classification of inorganic and organic colouring materials in accordance with chemical aspects

Inorganic and organic colouring materials are classified in accordance with chemical aspects as given in Figure 2.



Key

a Pigments that consist of more than one chemical compound and such the colouring effect of which cannot be traced back to only one constituent (e.g. multi-layer effect pigments), cannot be allocated unambiguously to a certain class.

b In this part of ISO 18451, it is refrained from a classification of inorganic dyestuffs.

c Materials in elementary condition and alloys.

Figure 2 — Classification of inorganic and organic colouring materials in accordance with chemical aspects

Examples regarding the classification in accordance with chemical aspects are given in Table 2.

Table 2 — Classification of inorganic and organic colouring materials in accordance with chemical aspects

No	Colouring material		Colour range	Colour index[a]	
3.1.1	**Inorganic pigments**				
3.1.1.1	**Pigments of chemical elements** (materials in elementary condition and alloys)				
	Aluminium	Al	Silvery glossy	Pigment Metal 1	77000
	Gold bronze	Cu-Zn	Golden glossy	Pigment Metal 2	77400
	Carbon black	C	Black	Pigment Black 6 + 7	77266
3.1.1.2	**Oxide/hydroxide pigments**				
	Titanium dioxide	TiO_2 rutiles	White	Pigment White 6	77891
		TiO_2 anatase	White		
	Zinc oxide/Zinc white	ZnO	White	Pigment White 4	77947
	Iron oxide yellow	FeO OH	Yellow	Pigment Yellow 42	77492
	Iron oxide red	Fe_2O_3	Red	Pigment Red 101	77491
	Chromium oxide green	Cr_2O_3	Green	Pigment Green 17	77288
	Iron oxide black	Fe_3O_4	Black	Pigment Black 11	77499
3.1.1.3	**Complex inorganic coloured pigments**				
	Bismuth vanadate	$(Bi,Mo,V)O_3$	Yellow	Pigment Yellow 184	771740
	Chromium titanium yellow	$(Ti,Cr,Sb)O_2$	Orange	Pigment Brown 24	77310
	Nickel titanium yellow	$(Ti,Ni,Sb)O_2$	Yellow	Pigment Yellow 53	77788
	Praseodymium yellow	$(Pr,Zr,Si)O_4$	Yellow	Pigment Yellow 159	77997
	Manganese brown	$(Ti,Mn,Sb)O_2$	Brown	Pigment Yellow 164	77899
	Cobalt blue	$CoAl_2O_4$	Reddish blue	Pigment Blue 28	77346
		$Co(Al,Cr)_2O_4$	Greenish blue	Pigment Blue 36	77343
	Cobalt green	$(Co,Ni,Zn)_2TiO_4$	Green	Pigment Green 50	77377
	Iron manganese brown	$Mn_2O_3 \cdot Fe_2O_3$, $Fe(OH)_2$	Brown	Pigment Brown 7 + 8	77727
	Chromium iron brown	$(Fe,Cr)_2O_3$	Brown	Pigment Brown 29	77500
	Zinc iron brown	$ZnFe_2O_4$	Yellow brown	Pigment Yellow 119	77496
	Iron manganese black	$(Fe,Mn)_2O_4$	Black	Pigment Black 26	77494
	Cobalt chromium iron black	$(Co,Fe)(Co,Cr)_2O_4$	Black	Pigment Black 27	77502
	Spinel black	$CuCr_2O_4 \cdot Fe_2O_3$	Black	Pigment Black 28	77428
3.1.1.4	**Sulfide/sulfide selenide pigments**				
	Zinc sulfide	ZnS	White	Pigment White 7	77975
	Lithopone	$ZnS + BaSO_4$	White	Pigment White 5	77115
	Cadmium yellow	(Cd,Zn)S	Yellow	Pigment Yellow 35	77205
		CdS		Pigment Yellow 37	77199
	Cadmium red	Cd(S,Se)	Orange/Red	Pigment Red 108	77202
	Cerium sulfide	Ce_2S_3	Orange	Pigment Orange 265	77283 : 1
			Red/brown	Pigment Red 265	77283 : 2

[a] See Introduction and Bibliography.

Table 2 *(continued)*

No	Colouring material		Colour range	Colour index[a]	
3.1.1.5	**Chromate/chromate molybdate pigments**				
	Chromium yellow	$Pb(Cr,S)O_4$	Yellow	Pigment Yellow 34	77603
	Molybdate orange/ red	$Pb(Cr,Mo,S)O_4$	Orange to red	Pigment Red 104	77605
3.1.1.6	**Silicate pigments**				
	Aluminium silicate[a]	$AL_2O_3 \cdot 2SiO_2 \cdot 2H_2O$	White	Pigment White 19	77004
	Ultramarine	$Na_6Al_6Si_6O_{24}Sn$ (n = 2 – 4)	Blue Violet/red	Pigment Blue 29 Pigment Violet 15	77007 77007
3.1.1.7	**Further pigments**				
	Barium sulfate[a]	$BaSO_4$	White	Pigment White 21	77120
	Calcium carbonate[a]	$CaCO_3$	White	Pigment White 18	77220
	Iron blue $M[Fe(II)\ Fe(III)(CN)_6] \cdot xH_2O$ mit M = Na, K oder NH_4		Blue	Pigment Blue 27	77510
3.2.1	**Organic pigments**				
3.2.1.1	**Azo pigments**				
	Acetoacetarylide		Greenish middle yellow	Pigment Yellow 1	11680
	Benzimidazolone		Yellow/Orange/ middle red red/carmine/ Bordeaux/ marron/ brown	Pigment Orange 36	11780
	β-Naphthol		Orange/ middle red	Pigment Red 3	12120
	Naphthol AS		Yellowish red/ Bordeaux/ carmine/ brown/violet	Pigment Red 112	12370
	Pyrazolones		Reddish yellow orange	Pigment Yellow 10	12710
	Laked ß-hydroxynaphthenic acid dyestuffs		Bluish red	Pigment Red 57 : 1	15850 : 1
	Laked ß-Naphthol dyestuffs		Yellowish red	Pigment Red 53 : 1	15585 : 1
	Azo condensation pigments		Yellow/orange/ scarlet/red/ brown	Pigment Red 144	20735
	Bisacetoacetarylide		Middle yellow	Pigment Yellow 16	20040
	Diarylide		Greenish to reddish yellow	Pigment Yellow 83 Pigment Yellow 13	21108 21100
	Disazopyrazolone		Orange/ yellowish red	Pigment Orange 13	21110
3.2.1.2	**Polycyclic pigments: Copper phthalocyanines**				
	Cu-Phthalocyanine epsilon blue		Reddish blue	Pigment Blue 15 : 6	74160

[a] See Introduction and Bibliography.

Table 2 *(continued)*

No	Colouring material	Colour range	Colour index[a]	
	Cu-Phthalocyanine-alpha-instable blue	Blue	Pigment Blue 15	74160
	Cu-Phthalocyanine-alpha-stable blue	Blue	Pigment Blue 15 : 1	74160
	Cu-Phthalocyanine-alpha-stable blue	Blue	Pigment Blue 15 : 2	74160
	Cu-Phthalocyanine-beta blue	Blue	Pigment Blue 15 : 3	74160
	Cu-Phthalocyanin-beta blue	Blue	Pigment Blue 15 : 4	74160
	Cu-Phthalocyanin-alpha blue	Greenish blue	Pigment Blue 16	74160
	Cu-Phthalocyanine-green chlorinated	Green	Pigment Green 7	74260
	Cu-Phthalocyanin-green halogenated	Yellowish green	Pigment Green 36	74265
3.2.1.3	**Polycyclic pigments: Diketopyrrolopyrroles**			
	Diketopyrrolopyrrole	Neutral139	Pigment Red 254	56110
	Diketopyrrolopyrrole	Yellowish red	Pigment Red 255	561050
	Diketopyrrolopyrrole	Bluish red	Pigment Red 264	561300
	Diketopyrrolopyrrole	Red range	Pigment Red 272	561150
	Diketopyrrolopyrrole	Yellowish orange	Pigment Orange 73	561170
	Diketopyrrolopyrrole	Orange	Pigment Orange 71	561200
3.2.1.4	**Polycyclic pigments: Quinacridones**			
	Quinacridone	Bluish red/violet	Pigment Violet 19	73900
	Quinacridone	Pink	Pigment Red 122	73915
	Quinacridone	Bluish red	Pigment Red 201	73907
	Quinacridone		Pigment Red 207	73900/ 73906
3.2.1.5	**Polycyclic pigments: Isoindolines and isoindolinones**			
	Isoindolinone	Reddish yellow	Pigment Yellow 109	56284
	Isoindolinone	Reddish yellow	Pigment Yellow 110	56280
	Isoindoline	Greenish yellow	Pigment Yellow 185	56290
	Isoindoline	Reddish yellow	Pigment Yellow 139	56298
3.2.1.6	**Polycyclic pigments: Perylenes and perinones**			
	Perylene	Bluish red	Pigment Red 179	71130
	Perylene	Bluish red	Pigment Red 178	71155
	Perylene	Red	Pigment Red 224	71127
	Perylene	Black	Pigment Black 31	71132
	Perylene	Black	Pigment Black 32	71133
	Perinone	Reddish orange	Pigment Orange 43	71105
3.2.1.7	**Further polycyclic pigments**			
	Anthanthrone	Scarlet	Pigment Red 168	59300
	Anthraquinone	Yellow/red	Pigment Red 177	65300
	Anthrapyrimidine	Greenish middle yellow	Pigment Yellow 108	68420
	Chinophthalone	Greenish yellow	Pigment Yellow 138	56300

[a] See Introduction and Bibliography.